oxide phase. However, phase of complex oxide of the second rare earth element "Re" and aluminum, such as $Re_3A_5O_{12}$ phase, is formed in some compositions.

As an additional effect, it may be possible to reduce the lower limit of the sintering temperature required for providing an aluminum nitride sintered body with a low volume resistivity, by adding the second rare earth element in addition to samarium. Further, the strength of the sintered body may be improved.

The second rare earth element other than samarium refers to the following sixteen elements; scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium.

The second rare earth element may preferably be one or more element selected from the group consisting of yttrium, lanthanum, cerium, gadolinium, dysprosium, erbium and ytterbium. In particular, it is possible to reduce the sintering temperature, to slightly increase the volume resistivity, to produce smaller grains and to give a larger strength by adding ytterbium, dysprosium or erbium. It is possible to slightly increase the volume resistivity and to give a larger strength by adding lanthanum. It is possible to slightly increase the volume resistivity by adding cerium or yttrium.

It is possible to reduce the lightness of the sintered body by adding the second rare earth element as well as TiO_2.

In a preferred embodiment, the molar ratio of total of converted contents of all the rare earth elements "Re" (including samarium) calculated as the oxides to a calculated content of aluminum oxide (Re_2O_3 / Al_2O_3) is 0.05

to 0.5. It is thereby possible to considerably reduce the volume resistivity of the sintered body at room temperature. The ratio (Re_2O_3 / Al_2O_3) may preferably be not lower than 0.1 and more preferably be not higher than 0.4.

The raw material of aluminum nitride may be produced by various processes, including direct reduction, reduction nitriding and gaseous phase synthesis from an alkyl aluminum.

Samarium oxide may be added to the raw material of aluminum nitride. Alternatively, a compound forming samarium oxide upon heating (a precursor of samarium oxide) may be added to the raw material of aluminum nitride. The precursor includes samarium nitrate, samarium sulfate and samarium oxalate. The precursor may be added as powder. Alternatively, a compound such as samarium nitrate or samarium sulfate may be dissolved into a solvent to obtain solution, which is then added to the raw material. It is possible to uniformly disperse samarium atoms between aluminum nitride particles, by dissolving the precursor of samarium oxide into a solvent.

The raw material may be shaped by any known methods including dry press, doctor blade, extrusion, casting and tape forming methods.

When adding the second rare earth element, the oxide of the second rare earth element may be added to the raw material of aluminum nitride. Alternatively, the compound of the rare earth element, including the nitrate, sulfate and alkoxide, may be dissolved into a solvent which may dissolve the compound. The thus obtained solution may be added to the raw material. It is thereby possible to uniformly disperse atoms of the second rare earth element in each region of the sintered body, even when an amount of the added rare earth element is very small.

In a formulating step, raw powder of aluminum nitride may be dispersed in a solvent, into which the rare earth element may be added in a

form of powder of the rare earth oxide or the solution described above. In a mixing step, it is possible to simply agitate the formulation. When the raw powder contains aggregates, it is possible to use a mixing and grinding machine, such as a pot mill, trommel and attrition mill, for grinding the aggregates. When using an additive soluble in a solvent for grinding, it is enough to carry out the mixing and grinding step for a short (minimum) time required for the grinding the particles. Further, a binder component, such as polyvinyl alcohol, may be added.

The solvent used for the mixing step may be dried, preferably by spray dry method. After carrying out vacuum drying process, the particle distribution of the dried particles may preferably be adjusted by passing the particles through a mesh.

In a shaping step of the powdery material, the material may be pressed using a mold to provide a disk-shaped body. The pressure for pressing raw material is not particularly limited, as long as the shaped body may be handled without causing any fracture. The pressure may preferably be not lower than 100 kgf / cm^2. The powdery material may be supplied into a die for hot pressing without particularly shaping the powdery material.

The sintered body according to the invention may preferably be produced by hot pressing a body to be sintered, preferably at a pressure of not lower than 50 kgf / cm^2.

The sintered body according to the invention may preferably be used for various members in a system for producing semiconductors, such as systems for treating silicon wafers and for manufacturing liquid crystal displays.

The invention further provides a member used for producing semiconductors. At least a part of the member is composed of an aluminum nitride sintered body containing aluminum nitride as its main component and